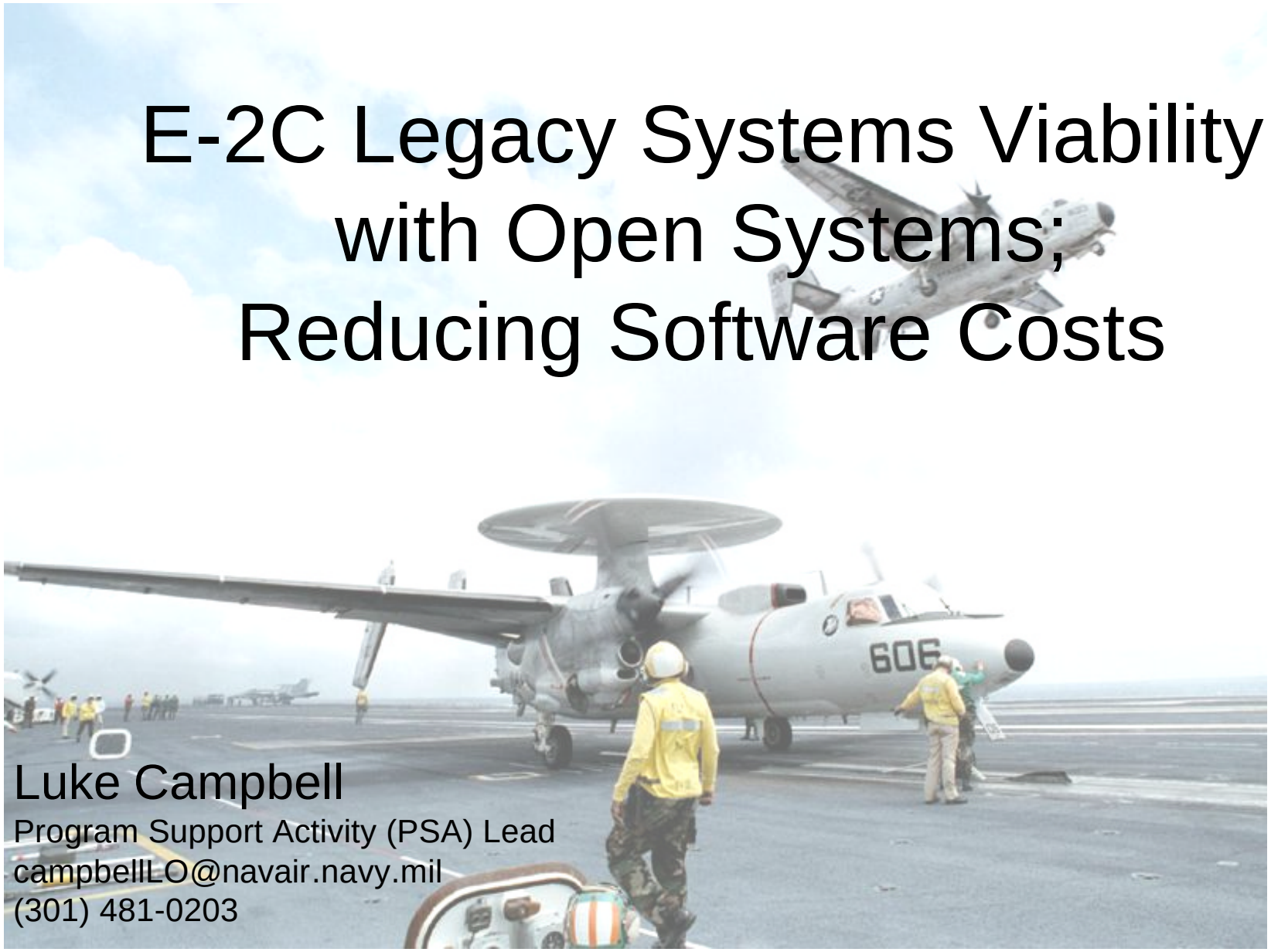
E-2C Legacy Systems Viability with Open Systems; Reducing Software Costs



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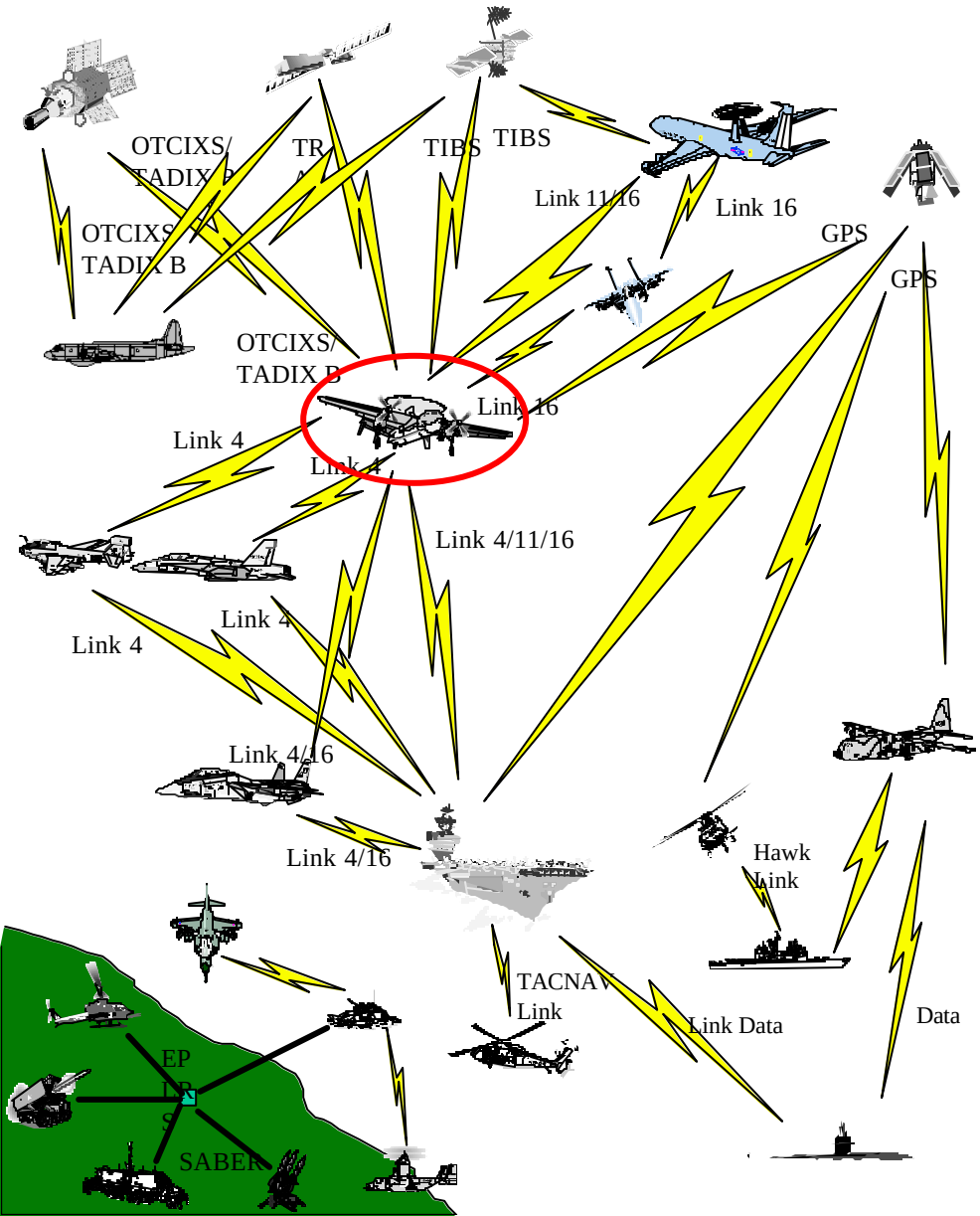
What is the E-2C ?



The E-2C system is an AEW - *Airborne Early Warning* - aircraft. It's purpose is to **SEE** great volumes of airspace (using radar and other sensors) and **TALK** to the fleet:

- UHF
- SATCOM Voice
- SATCOM Data
- VHF
- HF
- L-4
- L-11
- L-16 Data
- L-16 Voice
- CEC

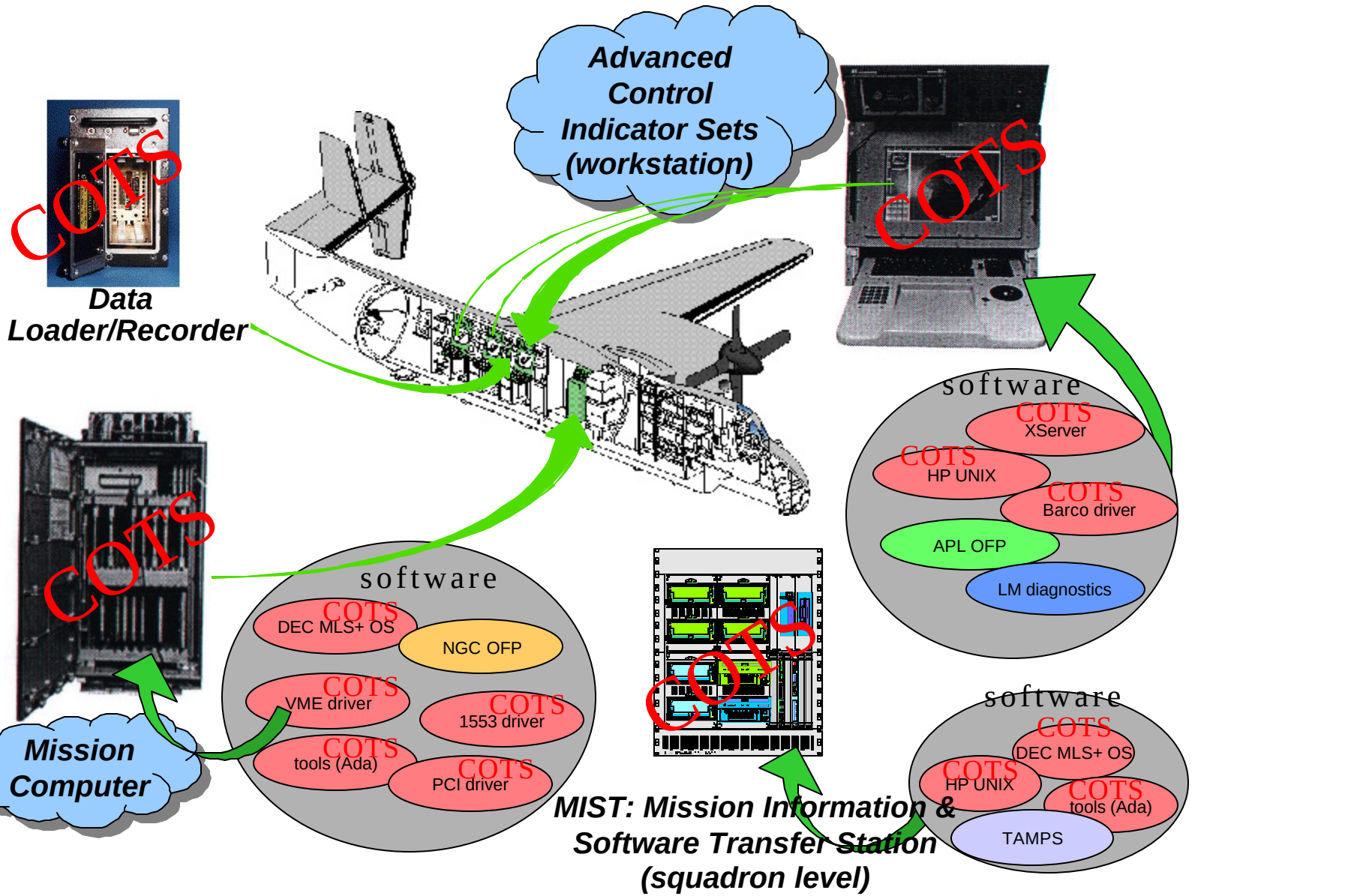
What's in the E-2C ?

- The E-2C is OLD ! This picture of our October 2002 production plane just delivered has been voted: "Best 1950's cockpit design"

We've Moved to COTS for New Production ...

.. perhaps to an extreme

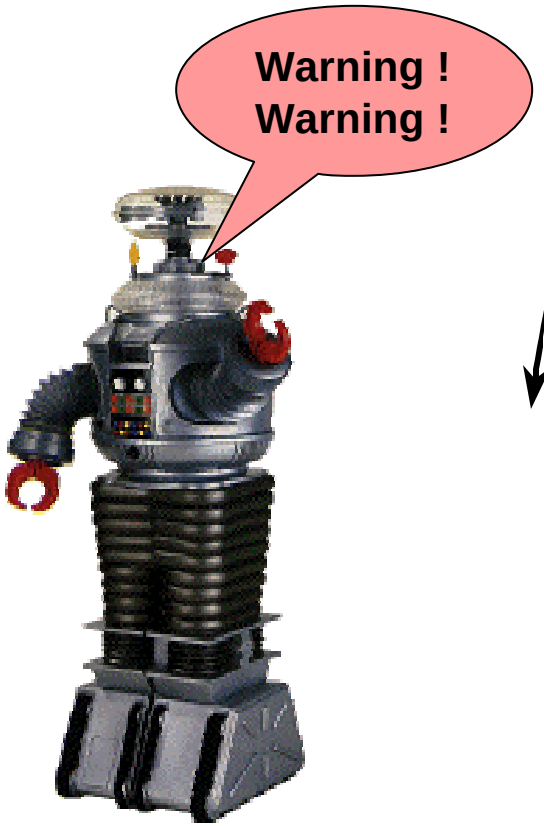
E-2C Mission System COTS: If each doesn't work, our $A_O = 0$



COTS Cautions

COTS-O-Meter

✓ Many COTS options available

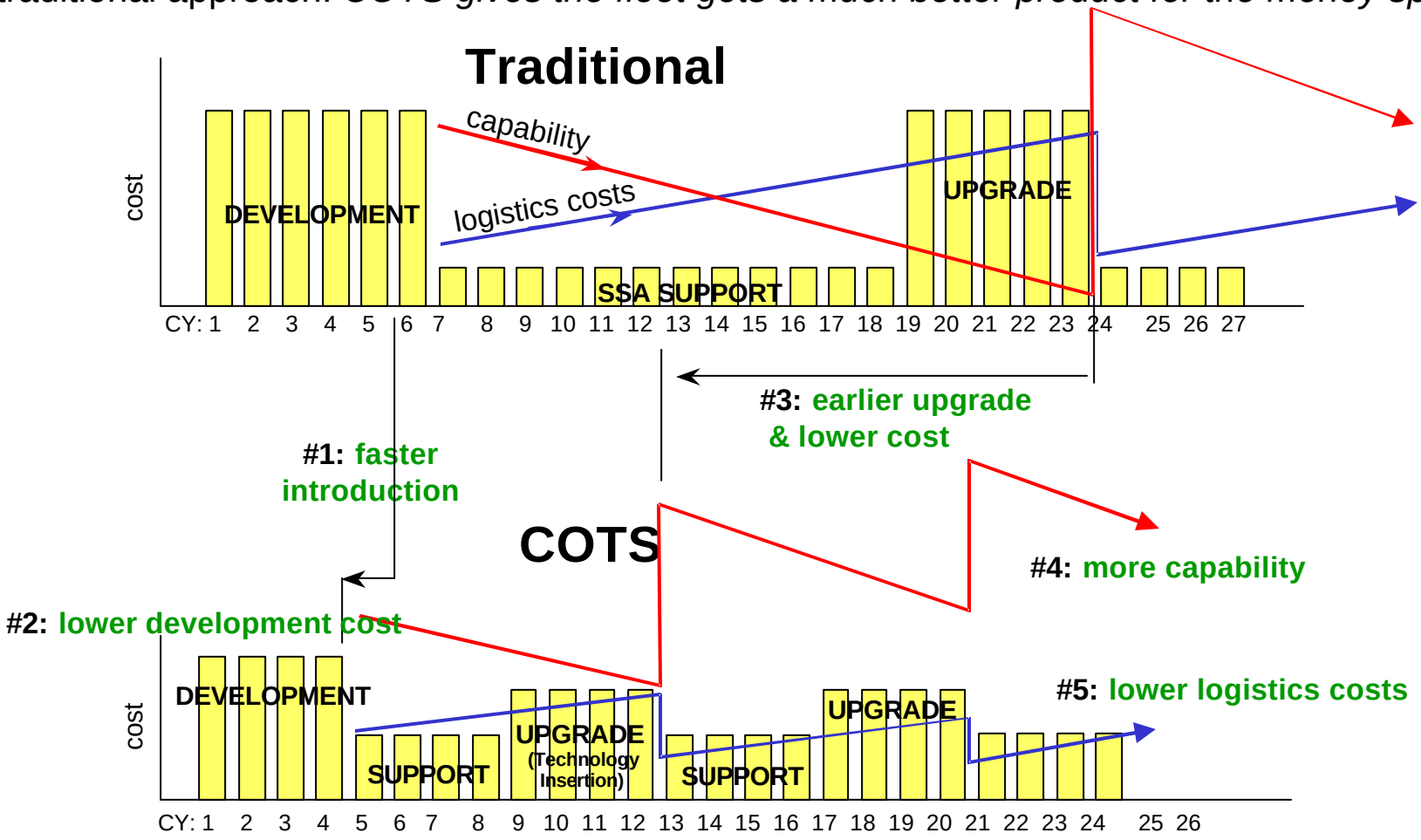


DoD Applications:

- ✓ Dial too far left - it won't run in your system
- ✓ Dial too far right - you can't afford it.

Traditional vs COTS Capabilities

- Our data does not show that COTS saves money over the life cycle .. HOWEVER: the COTS savings is really manifested as the **ratio** of performance to cost when compared to the traditional approach: *COTS gives the fleet gets a much better product for the money spent.*

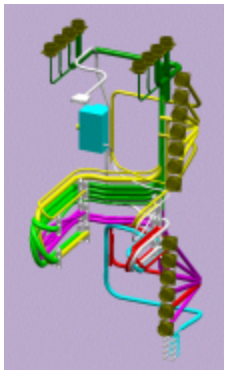


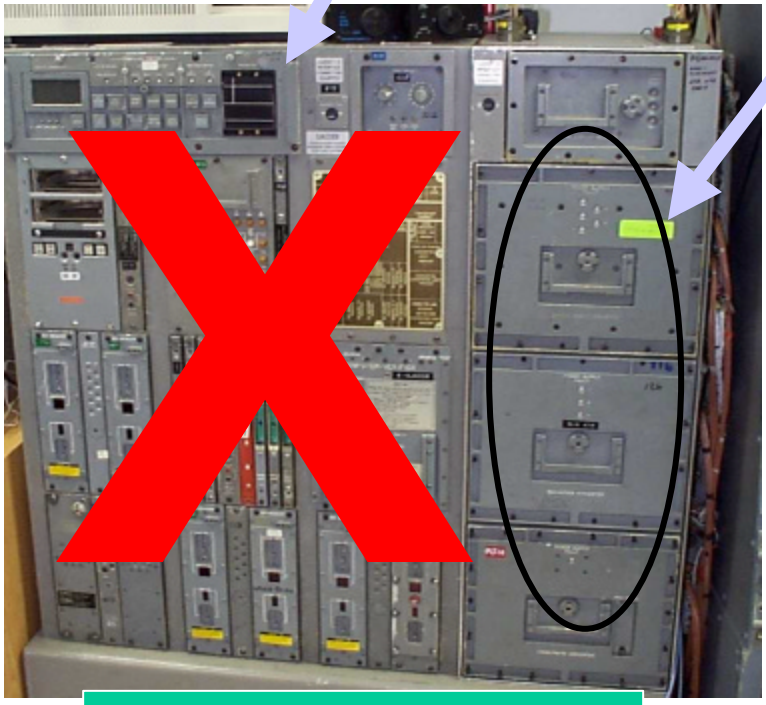
.. our legacy planes are getting COTS too

1) Remove MC (throw out "left side")

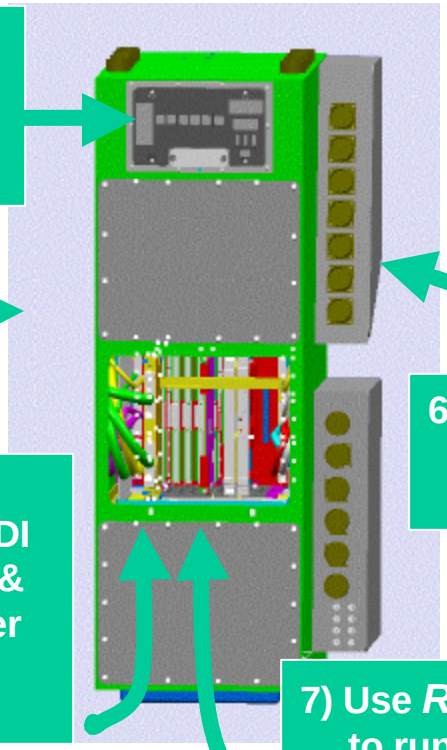
2) Save I/O cabinet (pull I/O drawers)

3) Replace buffer cabinet harness





4) Mount new CCP & RMSS



5) Mount COTS/NDI chassis & EMI Filter in I/O cabinet

6) Use existing A/C connectors

7) Use *RePLACE* to run existing MC OFP

8) Install power extension cable and floor covering

We call this Group II Mission Computer Replacement Program … or GrIIM RePr, for short.

There's a lot of Work in our Future

- We've got 2 Software Support Activities (SSAs) right now (for legacy "Lisa" code and Hawkeye 2000 Ada code)
  .. and trying to keep from getting a third for Advanced Hawkeye .. previously known as RMP (Radar Modernization Program)
- Using Middleware (Open Systems ! see next slide), we are connecting the HE2K displays to our Group II GrIIM RePrs.
  - ✓ This will allow us to use MC Ada software from the HE2K on Group II planes .. and neck-down to 1 SSA.

Middleware Defined

✓ **The GrIIM RePr architecture revolves around a relatively new concept called *Middleware .. an Open Systems concept.***

✓ **Middleware is being implemented by several companies today:**

- **TRW uses a form of Middleware called RePLACE, which is directed specifically at the legacy market**
- **DOD ASN(RDA) & PEO(T) requested that TRW RePLACE concept be analyzed to determine applicability to the E-2C**
- **The PSA began the GrIIM RePr program early in CY 2000 and started a contract with TRW in 3/02 to work out-year replacement of computers and software.**

✓ **Middleware is not dependent on the hardware base, i.e., the processor, or *engine*.**

✓ **Middleware is a layer on top of the hardware which adapts to your software.**

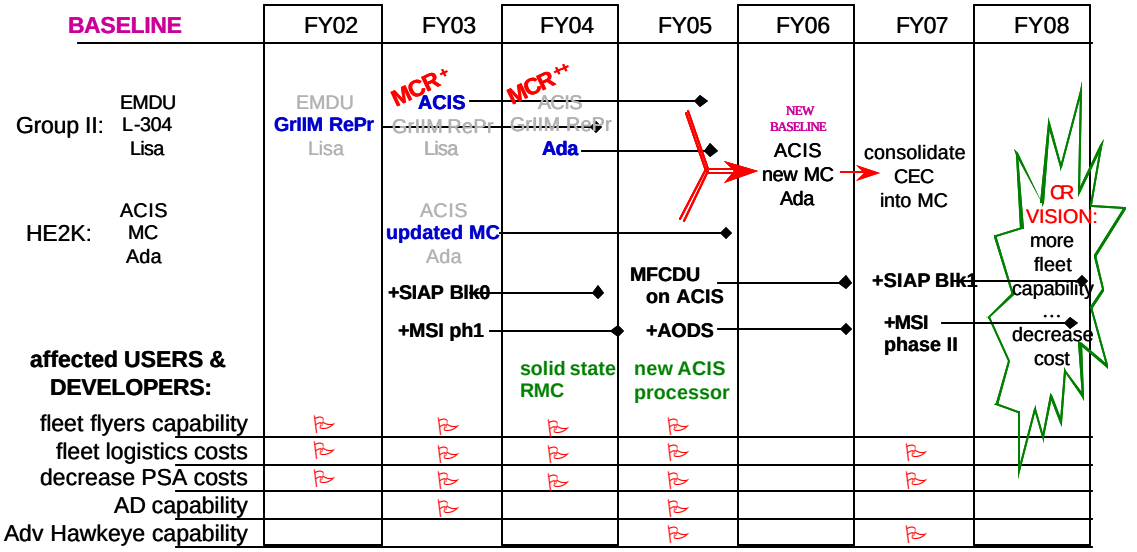
✓ **Since Middleware doesn't care which hardware vendor is used .. it provides the largest array of out-year possibilities.**

✓ **A large Middleware user base significantly offsets the NRE cost to any individual user.**

We've got a Roadmap

- Middleware is allowing us to:
  - upgrade our legacy systems; use the "old" software .. but with new tools (!) to decrease software costs,
  - increase performance of production systems,
  - decrease the number of SSAs,
  - provide for future growth,
  - keep us on the technology path to avoid obsolescence

E-2C CR Configuration Roadmap

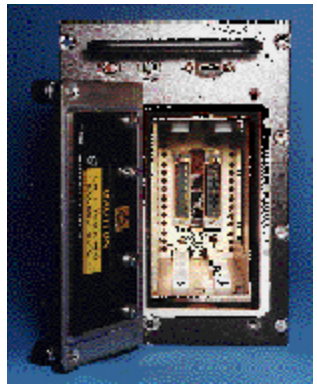


What have we Learned ?

Mission Computer is Militarized COTS:

- Same industry design; *minor* re-package of a proven design to fit E-2C form factor
  - ✓ Packaging was vendor choice to fit *industry* practices and E-2C performance requirements.
- Mission Computer works well; delivered on-time or ahead-of-time.
- Vendor strategy is to repair using EXACT hardware parts for 15 years (!)

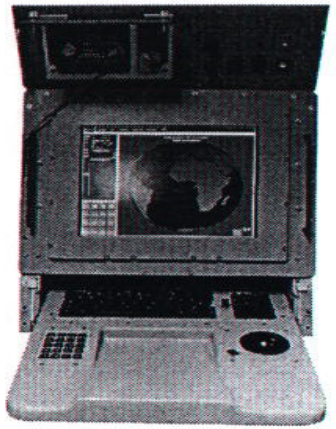
… IF all COTS vendors are like this,
COTS is nirvana !



Some lessons were mixed ...

ACIS was closer to off-the-shelf:

- Conformal coating on boards, but not repackaged
- Several problems with FFFI; but vendor is amenable and "making good" on the product
  - Oops! "Making good" takes time ... time and *resources* from your program.
- Each year, parts change: this affects new purchases, spares, and repairs.
  - Oops! Class II changes to the vendor become Class I changes to our platform.
- ☆ Lesson Learned: Establish an Industry/Gov team to maintain proper configuration.
  - Good news! Unit cost dropped over 60% by being part of a larger COTS commonality procurement.



A Summary

✓ **COTS is great .. but don't expect a life cycle cost reduction. What you get instead is a 40x better ratio of performance to cost over time.**

- ***There are a many of nuances to COTS use .. plan on change, lots of change !***
- ***With COTS, you don't drive the train, you just get to change seats .. frequently !***

✓ **Get out of the computer hardware development business by using Middleware .. spend more of your money on software functionality !**

- **Legacy system Computer Resource (hardware and software) costs *can be decreased.***

QUESTIONS ?